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✓NOTES ON THE  
INTERPRETATION OF  
AEROPLANE PHOTOGRAPHS

(Revised 4th Edition)

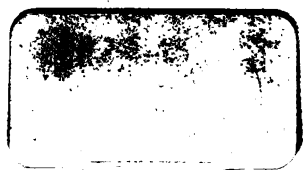
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WASHINGTON  
GOVERNMENT PRINTING OFFICE  
1918







# NOTES ON THE INTERPRETATION OF AEROPLANE PHOTOGRAPHS

(Reprint of Third Edition)

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ISSUED BY THE DIVISION OF  
MILITARY AERONAUTICS  
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## CONTENTS.

	Page.
<b>I.—General</b> .....	5
1. Types of photographs.....	5
2. The examination of photographs.....	5
3. The annotation of photographs.....	6
<b>II.—Trenches and wire</b> .....	7
4. Trenches.....	7
5. Wire.....	8
<b>III.—Dug-Outs and Mine Shafts</b> .....	9
6. Dug-outs.....	9
7. Mine shafts.....	9
<b>IV.—Machine Guns</b> .....	9
8. General.....	9
9. Siting.....	10
10. Types of emplacement.....	10
<b>V.—Trench mortars</b> .....	10
11. Types.....	10
12. Siting.....	10
13. Light trench mortar emplacements.....	11
14. Medium and heavy trench mortar emplace- ments.....	11
<b>VI.—Listening Posts and Observation Posts</b> .....	11
15. Listening posts.....	11
16. Observation posts.....	11
<b>VII.—Tracks</b> .....	11
17. General.....	11
18. Appearance on photographs.....	12
<b>VIII.—Railways</b> .....	12
19. General.....	12
20. Employment.....	13
21. Types.....	13
22. Appearance on photographs.....	13
<b>IX.—Buried Cables and Air Lines</b> .....	14
23. General.....	14
24. Cable trenches.....	14
25. Air lines.....	14
<b>X.—Concrete Structures</b> .....	14
26. Siting.....	14
27. Appearance on photographs.....	15



	Page.
<b>XI.—Fortified Shell Holes.....</b>	15
28. Types.....	15
29. Systematic shell hole system.....	15
30. Makeshift shell hole system.....	15
<b>XII.—Batteries.....</b>	16
31. The location of batteries as affected by topographical conditions.....	16
32. Construction of emplacements.....	17
33. Concealment.....	18
<b>XIII.—Snow Photographs.....</b>	18
34. Snow photographs.....	18
<b>XIV.—Rear Organizations.....</b>	19
35. Railways.....	19
36. Dumps.....	19
37. Billets.....	19
38. Aerodromes.....	20
<b>XV.—The Value of Aeroplane Photographs as Evidence of the Enemy's Intentions.....</b>	21
39. General.....	21
40. Offensive preparations.....	21
41. Defensive preparations.....	21
42. During actual operations.....	21
<b>XVI.—Special Types of Photographs.....</b>	22
43. Oblique photographs.....	22
44. Stereoscopic photographs.....	22
45. Stereoscopic oblique photographs.....	22
46. Method of setting up stereoscopic photographs..	22

## I.—GENERAL.

1. **Types of photographs.**—Aeroplane photographs may be divided into three main types, vertical, oblique, and stereoscopic.

(i) *Vertical photographs* are taken for different purposes at varying heights, and are the general photographs in use.

“Mosaics,” i. e., photographs assembled to form a complete photographic map of a given area, are useful for giving a comprehensive view of ground, and can be readily compared with isolated photographs taken later.

(ii.) *Oblique photographs* } See Chapter XVI. “Special Types  
(iii.) *Stereoscopic photographs* } of Photographs” on page 22.

2. **The examination of photographs.**—Before examining a photograph, it is necessary to form an idea of the appearance of objects from above, and to realize that objects will not appear under their usual aspect as seen from the ground. This is due to the fact that only the tops of the objects appear on the photograph.

Every opportunity should also be taken of studying on the ground objects similar to those which may require to be identified on a photograph. Thus, captured hostile trenches and positions should be visited until the different types of German works become thoroughly familiar.

Every opportunity should also be taken of studying the ground from the *air*.

During the actual examination of a photograph, the following important points should be remembered :

(a) The best available map should be studied with great care, so that the configuration of the ground and the salient features are familiar.

On no account should a photograph be studied without a map.

To locate the exact position of the photograph, it is necessary to set the photograph with the map, and by the aid of the north point which is marked on each photograph.

(b) An approximate idea of the scale of the photograph should be formed by comparing the distance between two fixed points on the photograph with the same points on the map.

(c) Having ascertained the position of the photograph on the map, and the scale, it is necessary before examining the detail of the photograph to ascertain the direction of the light. This can be done by studying the direction in which shadows are

thrown by trees, houses, shell holes, etc. The photograph should then be held so that the shadows fall toward one.

A thorough familiarity with the effect of shadows is an absolute essential to the correct study and easy interpretation of aeroplane photographs. A careful examination of the shapes and length of the shadow cast by an object not only discloses the nature and size of the object itself, but affords a valuable basis for estimating the dimensions of other objects shown on the photograph. It is also possible to determine whether an object is concave or convex.

Sketches are given at the end of the book to illustrate simple examples of shadows.

(d) Photographs should be examined systematically with the aid of a pointer, but care should be taken not to mark the photograph. Beginners should be warned against looking at a photograph as a whole rather than concentrating their attention on each detail.

(e) In examining a photograph, it is necessary to bear in mind every possible interpretation of any particular detail; the various probabilities must next be taken into account. It must then be determined whether there is sufficient evidence to justify a definite decision.

It must always be remembered that one photograph by itself may give little definite information, but, read in conjunction with other photographs, intelligence summaries, prisoners' statements, etc., much valuable information of either a positive or negative character may be obtained.

(f) Frequent comparison should be made with former photographs of the same object, as only thus is it possible to detect small changes. For this purpose a systematic method of filing photographs is essential.

(g) If photographs are annotated, care must be taken to avoid doing so until the photograph has been thoroughly examined, and then only in such a way as not to obliterate detail.

3. The annotation of photographs may be classified as follows:



(a) *Actual interpretation.*—In this case interpretation should be shown by the attachment of a slip of tracing paper to the photograph, and by marking on this the various objects to which it is desired to call attention.

Discrimination should be made between objects actually identified and those located from prisoners' statements or otherwise.

(b) *Markings to show new work.*—When marking up a photograph rapidly, to call attention to new work, the ordinary conventional signs should be used. (See below.)

(c) *Location.*—The names of topographical features, i. e., villages, trenches or roads, and map coordinates, should be inserted sparingly on vertical photographs, but more extensively on obliques, in order to facilitate identification and comparison with the map.

*Conventional signs for use on aeroplane photographs.*

Meaning.	Sign.	Instructions.
Machine gun.....	M. G	
Trench mortar.....	⊙	
Dugout.....	□	
Concrete structure.....	C.	
Fortified shell hole.....	F.	
Observation post.....	O. P.	
Wire entanglements.....	× ×	Crosses widely spaced shown in front of line of wire.
Gap or path in wire.....		A thin line drawn parallel to actual track.
Dump.....	Δ	
Battery.....		Drawn in front of and parallel to position.
A. A. battery.....	♂	
Listening post.....	L. P.	
Buried cable.....	— · —	} Drawn at intervals alongside the line, just clear of it.
Overhead cable.....	— · — · —	
Railway or trench tramway.....	— — — —	
Probable tank traps.....	◇	
New work.....	New.	

NOTE.—The sign to be written clear of the object on the photo, with a detached arrow pointing to it (when necessary).

## II.—TRENCHES AND WIRE.

4. Trenches are identified on photographs by the characteristic lines of traverse and fire-bays, showing up as dark and light lines, varying with the direction of the light. (See diagrams at end of book.)

Dummy or incomplete trenches can be identified by the comparative absence of shadow.

The extent to which spoil on the parapet or parados is conspicuous depends on the nature of the soil and the newness of the work.

Any unusual amount of spoil should be scrutinized carefully, as it may indicate subterranean work.

In ground where the normal type of trench can not be constructed, breastworks must be looked for; a careful study of the shadows will always reveal them. (See diagrams at end of book.)

When a trench system has been heavily shelled, the previous contrasts of tone rapidly disappear, and the interpretation of photographs becomes increasingly difficult; comparison with former photographs will then help to determine the degree of destruction.

The enemy has lately adopted the following system of camouflaging trenches. The trench system is covered over and the earth removed to some distance during construction, with the result that the trenches are insignificant or practically invisible on a photograph. Camouflaged trenches can only be discovered by a careful comparison with previous photographs of the area.

5. Wire shows up on a photograph as a broad line varying in tone from light gray to almost black, according to the newness of the wire and the contrast with the color and texture of the ground. The tracks made by working parties are often visible along either side of a belt.

As ground becomes cut up by bombardment, wire becomes increasingly difficult to distinguish.

The absence of signs of wire on a photograph must not necessarily be taken to mean that no wire exists. Oblique photographs will often reveal wire which does not cast enough shadow to show up on a vertical photograph. "Concertina" wire hardly shows up on photographs at all.

Wire is very often the earliest indication of a new line of defense.

Wire must also be looked for apart from the trench system:

Round fortified shell holes and strong points.

Round battery positions.

Round villages.

In hedges and ditches, although it is then difficult to find on photographs.

### III.—DUGOUTS AND MINE SHAFTS.

6. Dugouts can be detected in several ways, the most important of which is by the spoil thrown up.

Early photographs of a defensive system should be studied in order to see where fresh spoil has appeared. These places should be carefully noted for reference, as increasing care is now being taken to conceal the actual positions of dugouts by scattering the spoil.

In addition, the first indication of a projected line may often be given by the appearance of a line of dugouts.

The position of these dugouts should be carefully plotted, as in subsequent photographs, taken after the trench line has been completed, the dugouts may have been so camouflaged as to be no longer visible.

The relative size of dugouts may sometimes be gauged by the amount of spoil.

In some cases, in particularly clear photographs, the entrance to a dugout can be seen by a small black mark, which is frequently distinctly square in shape.

Dugouts should be searched for in rear of front-line systems, in sunken roads, railway cuttings, banks, and quarries.

7. Mine shafts are more difficult to distinguish, owing to the fact that great care is taken to conceal the spoil from the moment the work is undertaken. Spoil is often carried some distance by light railways.

Stereophotographs are often very valuable in disclosing work of this kind.

### IV.—MACHINE GUNS.

8. General.—Recent operations have shown that the Germans are depending less and less on fixed emplacements in the trench system. On the other hand, in certain quiet sectors of the western front, old types of machine-gun emplacements may still be found.

Machine-gun emplacements are extremely difficult to locate on photographs, which should be mainly used to corroborate reports from the line and information from other sources. The configuration of the ground should be very carefully studied, and those sectors of the line which obviously offer good fields of fire should be specially scrutinized.

The fact that a machine gun has been reported firing from a certain point does not necessarily imply that an emplacement exists.

**9. Siting.**—(a) *In the trench system.*—Machine gun emplacements may be looked for in a trench:

(i.) Where an angle occurs in the trench system, or a traverse is constructed so as to bring fire to bear to a flank.

(ii.) Within easy reach of a communication trench, with dugouts for the team close at hand.

(b) *Outside the trench system.*—Isolated machine-gun positions may be recognized by:

(i.) A small forward sap leading to an emplacement protected by a semicircle of wire.

(ii.) Excavations behind the front line (these are often connected by underground passages).

**10. Types of emplacement.**—(a) *The covered emplacement* may be discovered by a V-shaped mark in the forward edge of the parapet, where the latter has been cut away to allow the gun to traverse. At the back of this "V" or close beside it in the trench if the emplacement is entered from the side, may be found a dark spot similar to a dugout entrance.

(b) The open emplacement takes the form of a square tray or concrete platform let into the parapet. It varies in appearance according to the altitude of the sun, and may show up either as a white mark with a dark edge or as a comparatively dark square. The latter is hard to distinguish from the many dark cuts in the parapet, which may be sentry posts or firing recesses.

## V.—TRENCH MORTARS.

**11. Types.**—The Germans use various types of trench mortar, of which the usual types are the light, medium and heavy *Minenwerfer*. It is only by close cooperation with ground observers that the emplacements for these weapons can be definitely located.

**12. Siting.**—The following are likely sites for trench mortar emplacements.

(a) In the shallow disused trenches which often exist behind the German fire trenches, a portion of which is deepened to take the mortar.

(b) By the side of a communication trench.

(c) Along or near the terminus of a trench tramway (especially in the case of heavy trench mortars).

(d) Immediately in front of the parapet of a fire trench (very rarely met with).

**13. Light trench mortar emplacements.**—Light trench mortars are often fired from open emplacements to allow a rapid change of position, and it is difficult to distinguish the appearance of these emplacements from that of latrines and sump pits. One difference, which is by no means universal, is that trenches leading to trench mortar emplacements are more often zig-zag or traversed than are trenches leading to latrines.

**14. Medium and heavy trench mortar emplacements** are casemated and much more conspicuous. They can generally be recognized by an almost square, darkish mark in the center of a mound or ring of earth. This square mark is the top of the funnel up which the mortar fires, and differs in appearance according to the angle of light. (See diagrams at end of book.)

## **VI.—LISTENING POSTS AND OBSERVATION POSTS.**

**15. Listening posts** appear as small excavations either under the first belt of wire or just behind it. This is especially the case in the Hindenburg line. Their positions are generally disclosed by tracks.

Saps often lead out to listening posts, thus facilitating the location of the latter. Detached listening posts may also be found in "No Man's Land" encircled by wire, and traces of a covered approach or camouflaged trench may appear.

If the configuration of the ground permits, listening posts may be used as machine-gun positions.

**16. Observation posts** should be looked for on commanding ground, and any narrow isolated trenches should be carefully examined, especially if they lead to haystacks, ruined houses, or natural features.

Small trenches branching off from the trench system and constructed with no apparent object should be marked down as leading to possible O. P.s, especially if this occurs on ground giving a commanding view.

## **VII.—TRACKS.**

**17. General.**—Tracks form one of the most valuable guides to the enemy's activity, but are sometimes neglected because they are obvious.



A study of tracks will often reveal the following points:

Roads in use (by the parallel or divergent tracks in their vicinity).

The main communication trenches in use (by tracks running alongside, made by carrying parties at night).

Many tracks on both sides of trenches often indicate that trenches are in bad condition.

Dumps.

Billets and hutments (especially in woods).

Active battery positions.

Headquarters.

Wire which is almost invisible, and gaps through it.

Patrol paths.

Observation posts.

In villages, houses which are important centers.

Advanced listening posts.

Fortified shell holes.

In quiet parts of the line the appearance or gradual disappearance of tracks will often give valuable positive or negative information as to the enemy's activity in any particular locality.

During the artillery preparation new tracks leading to a group of dugouts under bombardment are sure signs that the dugouts have not been absolutely destroyed or that they have been reoccupied.

During the battle tracks should be studied carefully in order to discover whether certain new trenches or shell holes are in our occupation or the enemy's, and, when traffic routes are under bombardment, to see whether new ones are being made.

The value of a combined study of tracks and railways for indicating targets to machine guns and artillery, especially for night firing, is obvious.

**18. Appearance on photographs.**—The appearance of tracks varies with weather conditions; sometimes they show up as white lines of varying thickness, sometimes as darker ones.

## VIII.—RAILWAYS.

**19. General.**—Much information of strategical and tactical importance may be obtained from a close study of railways and trench tramways.

It is necessary to watch railway tracks carefully. The enemy has frequently laid down light railways to carry up material

for the construction of a new line of defense, and has then used only portions of them for supplies and ammunition when the line of defense has been occupied. The old tracks still remain and can rarely be distinguished from those of the lines in use except by evidence from other sources than photographs.

**20. Employment.**—Besides the normal guage lines, which were mostly built before the war, the enemy has made an extensive use of a system of light railways. Personnel, stores, and material are brought up by branch lines which run to nearly all important points and villages in the front-line system. Battery groups and single heavy batteries are almost entirely supplied by this method. Supply depots will necessarily occur at the breaks of gauge, as well as at various points along the tracks.

**21. Types.**—Light railway systems may be divided into the following groups:

1. 1 m. and 0.80 m. gauge (the former of which is the more common).

2. 0.60 m. gauge (the most common type of light railway in forward areas).

3. 0.40 m. gauge (this is confined to trench tramways).

**22. Appearance on photographs.**—Normal guage railways may be distinguished from light railways by the breadth of the track and by the size of the rolling stock used.

Light railways can be distinguished:

(a) By the straightness with which they run and by the absence of any sharp curves.

(b) By embankments and cuttings at points in their construction.

(c) By the bridges by which they cross streams, etc. A railway usually crosses an obstacle of this sort without altering its direction, whereas a path usually crosses a stream at right angles.

(d) By the sharpness of outline, as opposed to a track which usually becomes indefinite along its edge when used continually.

(e) By a tendency to appear darker than roads or tracks in use.

Light railways usually follow contours and defiladed ground, and may sometimes be discovered by the fact that they lead into trenches which have no traverses and sharp corners. It is very difficult to establish the presence of a light railway along a road, as it is generally constructed near a ditch and under

trees. The railway may often be discerned at corners of the road or at crossroads, where it is necessary for the lines to leave the road or to make a more gradual curve.

## **IX.—BURIED CABLES AND AIR LINES.**

**23. General.**—It is important that buried cables and air lines should be marked down when fresh, as they tend to disappear quickly.

**24. Cable trenches** are a valuable aid in discovering the positions of headquarters, telephone dugouts, camouflaged batteries, observation posts, and important centers. Where the buried cables end the air-line system may be picked up.

Cable trenches can be distinguished when open by their more or less straight course and narrow construction, and when filled in by their irregular definition and "woolly" appearance. Where they cross other trenches a gap appears, as the lines are passed under the trench flooring.

**25. Air lines** appear as a series of regular white dots, these being the displaced earth where the poles have been erected. These dots are connected by a thin white track, which is made by the men walking from pole to pole when putting up the wire.

Air lines will sometimes come to life again on a photograph if the ground has been cultivated or plowed, and they then show up as a succession of small dark islands, where the soil around the posts has not been disturbed. In clear photographs the shadows thrown by the poles can be seen.

In snow, when the drops from the wire and posts have melted the snow, air lines appear as a succession of evenly placed black dots connected by a thin black line.

## **X.—CONCRETE STRUCTURES.**

**26. Siting.**—Concrete structures, which are very often loop-holed and used for machine guns, should be looked for more especially in areas where low-lying ground makes the construction of deep dugouts impossible.

They are usually sited as follows:

- (a) In ordinary trench lines.
- (b) Among farm buildings and in villages, where they are liable to be confused with the surrounding houses.
- (c) In the open or under trees.

(d) Actually inside buildings themselves, when they are not apparent until the buildings have been destroyed by shell fire.

**27. Appearance on photographs.**—Owing to the fact that concrete structures are sited with a view to avoiding observation, they are often difficult to locate until the whole area has been cleared by heavy shell fire. After intense bombardment they appear as square or oblong blocks standing up above the level of the ground, having in most cases survived the prevailing destruction owing to their superior powers of resistance. The shadows which they cast should be carefully studied, so as not to confuse them with square holes dug in the ground.

During construction concrete structures are often detected by:

1. The whiteness of the new concrete itself.
2. The whiteness of the ground around the point where the concrete is mixed.
3. The presence of tram lines used to carry the material.

## **XI.—FORTIFIED SHELL HOLES.**

**28. Types.**—Fortifying and organizing shell holes has now become a definite method of German defense, and can practically be divided into two categories:

(a) The systematic preparation of organized shell holes before an offensive.

(b) The mere makeshift consolidation of shell holes during a battle.

**29. Systematic shell hole system.**—In such systems, the shell holes, which are nearly always sited in pairs, are generally constructed in well-drained ground and are usually connected with each other by an underground passage leading to a common dugout.

The sides of the shell holes are revetted, and in some cases the tops are roofed over and camouflaged.

Shell holes of this kind are not difficult to find on photographs and are distinguishable from ordinary shell holes by—

Their more definite appearance.

Spoil which is dumped in neighboring holes.

Tracks.

The entrance to the dugout, which can often be seen in them as a small black spot.

**30. Makeshift shell hole systems** are more difficult to detect on photographs, which must be examined with great care.

The shell holes are distinguished from ordinary shell holes by their darker appearance, owing to their having been deepened by the enemy.

They may be square or oblong; at times, however, the enemy occupies a shell-hole position without working on it at all.

Tracks are by far the surest indication, and particular attention should be devoted to any patches of dry ground where occupied shell holes are most likely to be found.

## XII.—BATTERIES.

**31. The location of batteries as affected by topographical conditions.**—Types of battery emplacements, and the degree of difficulty in locating them accurately differ according to the topographical features on the various sectors of the front. The area opposite the British may be divided as follows:

(a) The thickly populated mining area.

(b) Close country, with scattered houses and frequent woods, hedges, and orchards.

(c) Wooded country.

(d) Open country, intersected by ravines and sunken roads.

(a) *In the mining area*, the ground is usually broken, and numerous slag-heaps and quarries afford cover. The problem of guns in houses is a difficult one. Sections of a battery or single guns may be detached and placed irregularly. In "*Cités*" the houses are of stereotyped pattern and may all have been knocked about. Débris litters the ground and helps to conceal tracks or traces of frequent use. Guns are placed in casemates in a house, a portion of which is pulled down over them to give extra cover; this has the effect of giving the house an appearance similar to that of any other ruined building in the vicinity.

(b) *In close country*, in addition to houses, there are many hedges and orchards which afford good battery positions. Hedges, ditches, and roads should be watched carefully for battery positions along them.

(c) *In wooded country*, especially if the woods are of any extent, batteries are difficult to locate with accuracy owing to the fact that just when conditions are most favorable for air photography (i. e., in spring and summer), the leaves and natural cover are thickest. Camouflage with fresh branches and undergrowth is a simple matter, and tracks which can be seen entering a wood are soon lost inside it.

(d) *In open country*, where there are few villages and woods, batteries are almost invariably dug in and provided with heavy cover. For this reason they are more obvious, except where special care is taken to incorporate them into existing trenches.

In country intersected by ravines and sunken roads, batteries can be dug into the sides of a ravine or road and well hidden. The roads are all more or less used, because they afford natural cover, and signs of extra use at any point are not too apparent.

**32. Construction of emplacements.**—Normally, batteries are in definitely constructed emplacements. During operations, batteries are occasionally sited in the open with or without camouflage.

The principal object is to provide cover for men as well as guns, and it may be taken for granted that, unless the battery is in or on the edge of a village, where the personnel can be billeted in an adjacent house or cellar, each battery will usually have dug-outs and ammunition stores close to or adjoining the pits. These dug-outs may be at either end of the position, or in between the pits or close at hand. In nearly every case, they will be as heavily protected as the pits themselves.

A feature with batteries in exposed positions is a covered trench leading from an adjacent road or trench, enabling personnel and ammunition to enter the battery without leaving tracks above ground.

It is important to note the grouping of pits, which are not always equally spaced.

When batteries are forced to retire, the Germans have sometimes constructed emplacements of the normal type in the new position, but during extensive operations it has been very common for guns to come into action in the open without protection for the guns themselves or for the battery personnel. In this case, one would expect to find the battery near a road or in a position where the natural features of the ground give a certain amount of protection.

It is now becoming general for the enemy to construct a number of emplacements largely in excess of the number of batteries in action. This is done with the object of minimizing the effect of our counter-battery shots by enabling guns to fire from a number of alternative emplacements. Also, numerous battery positions are apparently constructed with a view to the provision of emplacements in case of the necessity for withdrawal, and are left unoccupied.

**33. Concealment.**—It is evident that increasing care is being taken to conceal emplacements and to defeat the camera. New battery positions are now often concealed by overhead cover, but they may be detected by the tracks or tramways leading to them. Although the battery emplacement itself is concealed, it is difficult to conceal the activity to it and round it.

Blast marks made by the guns help to defeat the camouflage. Under ordinary conditions, they show up as white scores where the surface has been blown away by the discharge, or, in snow photographs, as black smudges. In dry weather, blast marks may be visible for some time after the position has been vacated, and are therefore not a proof that an emplacement is occupied. In themselves they only prove that a position has been active, not that it is active—a distinction which is liable to be forgotten. It has, however, been definitely proved that an emplacement is active by an immediate snow photograph, which shows fresh activity and blast marks.

### **XIII.—SNOW PHOTOGRAPHS.**

**34. Snow photographs.**—Photographs taken immediately after a fall of snow may often reveal facts which are difficult or even impossible to determine otherwise. They are of the greatest value in disclosing:

- (a) Which trenches are actually in use.
  - (b) Which batteries are active.
  - (c) Tracks in use.
  - (d) Wire.
  - (e) Ditches which contain water.
  - (f) Occupied dug-outs
  - (g) Camouflage.
- (a) Trenches actually in use are betrayed by the fact that the snow in the trench has been trodden down, and is therefore black instead of white.
- (b) The activity of batteries is given away by the blast marks on the snow, which show black.
- (c) In snow, tracks show up very much more clearly than usual, and the fact that they are recent is brought out in a convincing manner.
- (d) In snow, wire shows as a black band, and so becomes visible in cases where, without snow, it would not be so apparent.

(e) Ditches which contain water show black against the white background of the snow.

(f) Dugouts which are occupied are sometimes revealed by the melting of the snow caused by the fires inside.

(g) Camouflage becomes more readily apparent when snow has fallen, as a different type of camouflage is usually necessitated to tone in with the snow background.

#### XIV.—REAR ORGANIZATIONS.

**35. Railways.**—The study of railways is dealt with in Chapter VIII, on page 7.

It is most important to identify new railway construction, which should then be considered in relation to any other indications of enemy activity. By this means the enemy's system of supply and often his intentions may be deduced.

**36. Dumps.**—Dumps are distinguished by the material actually stored and the activity in the immediate surroundings.

Whether a dump is for supply or ammunition may be determined very often on photographs. Ammunition dumps are usually arranged in small stores with intervals between. Supply dumps have no particular arrangement.

Details as to the nature and purpose of the dump will generally be obtained by the collation of prisoners' statements, the reports of agents and *rapatriés*, and the information obtained from the actual photograph.

Dumps are in nearly every case sited near important railways (with sidings feeding them), or alongside canals and roads, where in summer the shadows cast by trees make identification more difficult.

Forward dumps are often concealed in woods, and their presence may be inferred by the existence of a light railway and signs of unusual traffic in the vicinity.

**37. Billets.**—Hutments are easily distinguished on photographs. A comparison with correct topographical maps, and reports of *rapatriés* and prisoners, and old photographs, will show whether they are of German construction.

Considerable activity leading to and round woods is frequently observed, although the hutments themselves are sometimes difficult to see within the wood, owing to concealment by trees. Such areas should be indicated as probable billets or bivouacs.



**38. Aerodromes.**—Hostile aerodromes may be recognized on photographs by the following indications:

- (a) Hangars.
- (b) Preparation of the ground.
- (c) Landing "T's" or small smoke fires, giving the direction of the wind.
- (d) Machines on the ground.

All, or a combination of these indications, may appear on any one photograph of a hostile aerodrome.

The various details are as follows:

(a) *Hangars.*

(i) Small canvas hangars accommodating two scouts or one two-seater machine. They appear on a photograph semi-circular in shape and of a light color.

(ii) Small (wooden) sheds accommodating one scout. They are rectangular in shape, dark in color, and usually placed close together. They are used by pursuit flights.

(iii) Long wooden sheds, rectangular in shape, with the rear angles cut off. They appear dark in color, and are generally used by reconnaissance and artillery flights. Each shed accommodates two two-seaters.

(iv) Large canvas hangars for twin-engined bombers. They are rectangular in shape with the four corners slightly rounded off. They are light colored on photographs as in (i).

(v) "Bessonneaux" type. These hold several machines and appear rectangular on photographs and generally of a darker color. Shadows frequently show this type as having an arched roof.

(vi) Large wooden hangars or lattice girder structures. They are usually found at aircraft parks such as St. Denis Westrem or Ramegnies Chin.

(b) *Preparation of ground.*

(i) Trees along roads bordering on aerodromes will have been cut down.

(ii) Drainage shows up usually as a "herring bone" pattern on photographs.

(iii) By-roads passing across an aerodrome, especially where built on an embankment or in a cutting, will show on photographs the result of leveling.

(c) *Landing "T's" and smoke fires.*

(i) Landing "T's" show up as a small white "T" on photographs.

(ii) Prisoners have stated that landing "T's" were so conspicuous that some flights prefer to utilize small fires to indicate the direction of the wind. These fires appear on photographs as a small line of smoke originating from a point.

*(d) Machines on the ground.*

These show up much in the same way as landing "T's," but the span of the wings is always considerably greater than the length of the machine, which is the reverse in the case of a landing "T." Photographs taken at a height of 12,000 feet or less generally show an indication of the black iron cross on the extremity of the wings.

## **XV.—THE VALUE OF AEROPLANE PHOTOGRAPHS AS EVIDENCE OF THE ENEMY'S INTENTIONS.**

**39. General.**—The general policy of the enemy, whether offensive or defensive, can generally be ascertained by a study of aeroplane photographs, read in conjunction with information from other sources.

The most important points to look for are shown in the following paragraphs:

**40. Offensive preparations.**—(a) A sudden increase in the artillery activity, in the number of battery positions, and in new aerodomes.

(b) An increase in the number of communication trenches.

(c) An increase in the light railways and dumps.

(d) A series of saps pushed forward and linked up to form "jumping-off trenches" in advance of the front line.

(e) The construction of assembly trenches.

**41. Defensive preparations.**—(a) New lines of barbed wire, behind which occasional traverses and dugouts appear, marking the trace of an intended new line.

(b) A general strengthening and deepening of trenches.

(c) Additions to existing wire.

(d) The rapid marking out and construction of new switch lines.

(e) An increase in the number of battery positions.

**42. During actual operations.**—(a) Tracks leading into shell holes containing detached parties and machine guns.

(b) Old battery positions, which are often wired around and converted into strong points.

(c) Blocks and barricades in communication trenches.

- (d) Craters in roads (generally antitank).
- (e) New tracks across country.
- (f) New active battery positions.

## **XVI.—SPECIAL TYPES OF PHOTOGRAPHS.**

**43. Oblique photographs.**—An oblique photograph may be considered as a panoramic view of the area covered by the vertical photograph, and the two, when possible, should be examined together.

Oblique photographs contain much valuable topographical detail and indicate the general slopes and contours.

**44. Stereoscopic photographs** have now come into general use and are of the greatest value in determining detail not easily seen on the ordinary vertical photograph, such as the comparative relief of different objects.

They should be employed whenever possible.

**45. Stereoscopic oblique photographs**, which show undulations of ground, however small, are very valuable in the study of ground prior to an offensive, and should be used in conjunction with the map, to discover features of tactical importance which may not be shown on the map.

**46. Method of setting up stereoscopic photographs.**—To obtain a stereoscope effect, take two photographs of the same object (two copies of the same photograph will not do, a fact which is not always recognized) and place one photograph on the top of the other, so that the features on one coincide with the same features on the other.

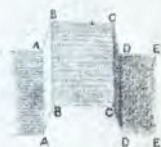
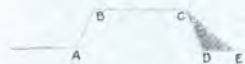
Draw the top photograph aside, keeping the features under examination parallel the whole time until, at about 2 inches apart, the images will again fit, and houses and trees will stand up as in nature.

The photographs must be placed in the order in which they were taken, i. e., the left-hand picture on the left side, as otherwise the features will appear reversed, and houses will sink into holes and cuttings will become embankments.

At first the number of images may be confusing, but a few minutes' practice will be enough to accustom the eyes to pick up the two required.



'LIGHT AND SHADE ON HOUSE



EMBANKMENT

*Gun Emplacements, without shadows.*



*with shadows.*



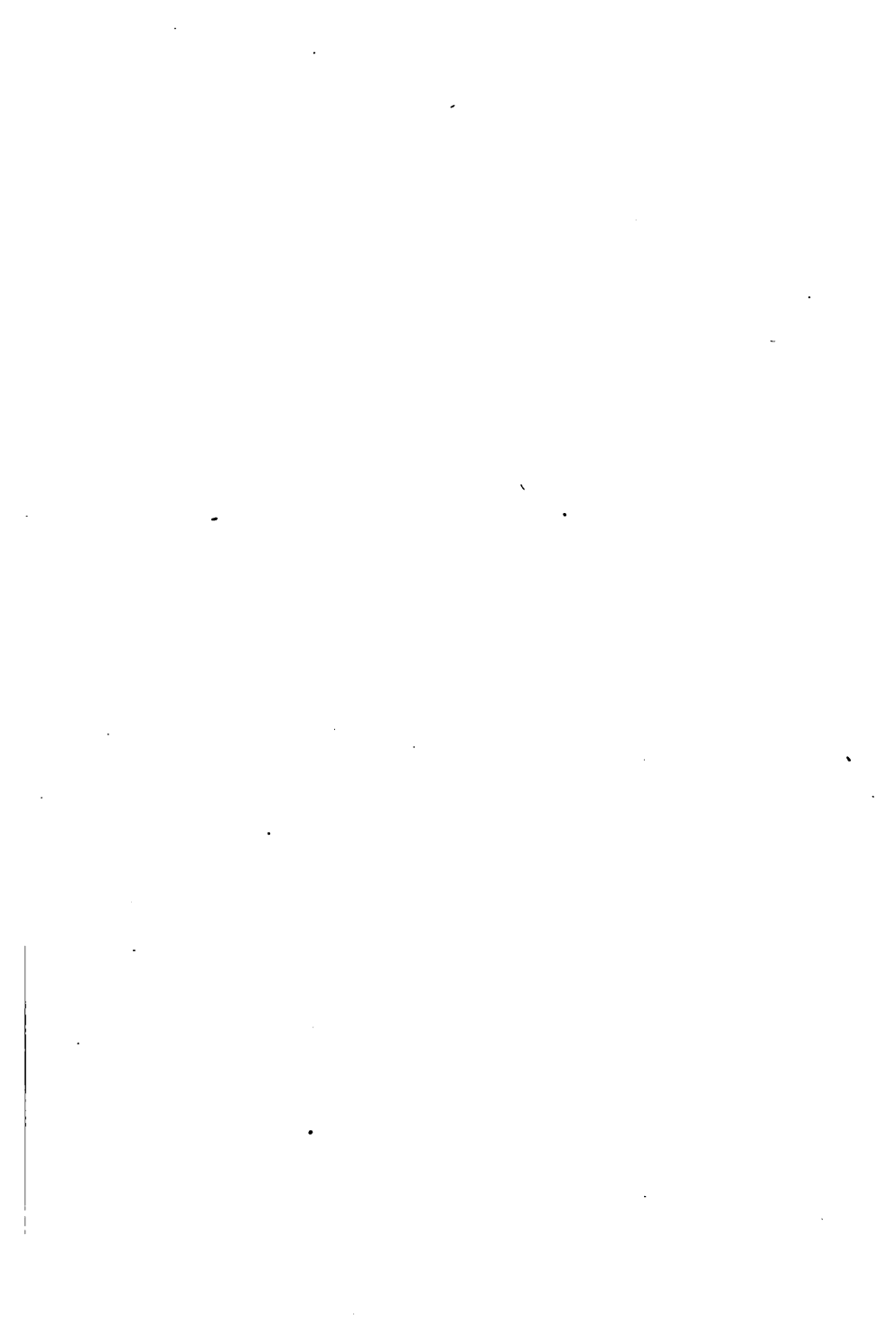
*uncovered and empty.*

*covered, and possibly occupied.*



TRENCH MORTAR EMPLACEMENTS













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